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INNOVATION BROKERS AND THEIR ROLES IN VALUE CHAIN-NETWORK INNOVATION: PRELIMINARY FINDINGS AND A RESEARCH AGENDA

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Abstract — Intervention approaches have been implemented in developing countries to enhance farmers' livelihoods through improving their linkages to markets and inclusiveness in agricultural value chains. Such interventions are aimed at facilitating the inclusion of small farmers not just in the vertical activities of the value chain (coordination of the chain) but also in the horizontal activities (cooperation in the chain). Therefore value addition is made by not just innovating products and services, but also by innovating social processes, which we define as *Value Chain-Network Innovation*. In Value Chain-Network Innovation, linkage formation among networks and optimisation is one of the main objectives of innovation enhancing interventions. Here some important roles for innovation brokers are envisaged as crucial to dynamise this process, connecting different actors of the innovation system, paying special attention to the weaker ones. However, little attention has been given to identify different innovation brokering roles in those approaches, and to the need that they facilitate innovation processes and open safe spaces for innovation and social learning at different organisational settings and levels, to have more effective and sustainable impacts.

This paper offers some preliminary empirical evidence of the roles of innovation brokers in a developing country setting, recognising the context-sensitive nature of innovations. Two cases from work experience with intervention approaches are analysed in light of the theories of innovation brokering, presenting some empirical evidence of different types of arrangements made by innovation brokers. A third case was taken from the literature. Data from questionnaires, key informant interviews, participant observations of different types of activities and processes carried out in those approaches, SWOT analysis and project reports were used for the analysis of different types of brokering roles and to draw some lessons.

One important outcome of this preliminary analysis was that Information and Communication Technologies (ICT) in integration with other media facilitate new ways of social organisation and interaction of innovation networks, which offer more possibilities for processes of innovation, aggregating value to the production and sharing of knowledge. There is already a transition of paradigm for approaching agricultural innovation to more participative and open approaches, which offers a promissory landscape for organising the value chain actors in a way that is more favourable for small farmers.

Key words: innovation brokers, intervention approaches, value chain-network innovation, developing countries, ICTs and traditional media.

1. INTRODUCTION: ORGANISING THE VALUE CHAIN-NETWORK AS A MEANS OF IMPROVING SMALL FARMERS' LIVELIHOODS

Over the past 20 years, new trading policies have liberalised and integrated markets (KIT and IIRR, 2008; KIT, 2006) and farmers are increasingly supplying long and sophisticated value chains and have to meet stringent food safety standards (Vellema and Boselie, 2003; Ton et al., 2007).

New opportunities are open to small farmers to reach international markets, but these opportunities also represent significant challenges for them (Vermeulen et al., 2008). For a product to reach the consumer, different stakeholders interact in value chain networks, which are highly complex systems (Kaplinsky and Morris, 2000; Hanf and Pieniadz, 2007; Ruben and Slingerland, 2006), with flows of resources and information at various stages of the chain. While a proportion of farmers have benefited from their interaction in these value chains, many farmers, especially in developing countries, have experienced a reduction in their incomes as the prices of agricultural commodities have fluctuated (KIT, 2006). However, benefits for farmers should not be limited to an improvement in their incomes, but also in an enhancement in their capacity to react and adapt to various types of shocks and market failures (Vermeulen et al., 2008; Mendoza and Thelen, 2008), in other words, in improving their capacity to innovate. Innovation in agriculture (including value chains) is highly important considering that over a quarter of the human population depend on this activity for their livelihoods and there is no single "technology package" that works for people from different contexts, needs and characteristics. Innovation is not a linear process; on the contrary, it is an uncertain, unpredictable, complex, dynamic and random process (Van de Ven et al., 2008; Kanter, 1988). These ideas have been recently captured in the concept of Agricultural Innovation Systems (World Bank, 2006).

There are various novel approaches to make agricultural value chains more inclusive of the poor. However, chances for innovation are reduced when innovation approaches are attached to planned innovation trajectories that are forced to comply with expected impacts, without considering the context sensitiveness of innovations. One of the current debates surrounding the concept of Agricultural Innovation Systems is on the usefulness of research results in intervention approaches. The critique is that those results are not being translated into tangible benefits that improve the livelihoods of the poor, (Clark, 2001; Horton, 1986; Hall et al., 2001), so that there is a gap between scientific knowledge and practice (Kristanjonson et al., 2009). For filling this gap, as well as other gaps between actors caused by cognitive or institutional differences, some authors have underlined the importance of learning platforms, co-boundary spanning spaces, protected spaces or niches, and dialogical spaces (Kristjanson, 2009; Goldberger, 2008; Spielman et al., 2007; Schot et al., 2008; Leeuwis, 2004) in which different actors can communicate, learn and discover together new options or more effective innovations. Innovation consists on trying new things or trying to do things differently (Fagerberg et al., 2009: 1).

It has now become recognised that a specialised innovation broker, whose main aim is to overcome these gaps, can play an important role in optimising interaction in Agricultural Innovation Systems, and also enhancing the innovation capacity of small farmers. However, with the exception of some studies (e.g., Devaux et al., 2009), this innovation broker role has not been studied integrally in the context of value chains. This paper contributes to filling this void by exploring the kinds of innovation brokering roles that have been played in different intervention approaches that seek to foster value chain-network innovation. In doing so, we also seek to gain a better understanding of their significance, and identify possible

challenges and constraints. The paper commences by providing a conceptual background on recent thinking on innovation, and the role of innovation brokers. It then presents a number of cases in which this role is applied to value chain-network innovation at different organisational settings and levels.

2. INNOVATION AS A MULTIDIMENSIONAL AND DYNAMIC PROCESS

It has been recognised that innovation is not a linear process, in which research results are just transferred to farmers by extension services. Neither does it take place in isolation: as the Innovation System approach argues, instead it takes place in interconnected networks of actors. Innovation is both about technology development and institutional and organisational developments, and thus can be considered an effective combination of hardware, software and 'orgware' (Smits, 2002). Hardware refers to the technological part of innovations, whereas software is the different types of knowledge that are shared by different actors that participate in shaping the innovation. 'Orgware' refers to the "social and institutional conditions that influence the development of an invention into an innovation and the actual functioning of an innovation", where the other dimensions are organised, shaped and negotiated, thus the importance of a dynamic and tailored management of innovation networks at different organisational levels.

Hence, for small farmers to improve their capacity of innovation in agricultural value chains, various factors have to be considered. An agricultural value chain implies a combination of numerous conditions that need to be in place before a product is consumed, such as: organisational arrangements, capacity building, technological options (e.g. mechanisation of agriculture), compliance with quality standards and control, a supporting policy framework, financial incentives, and credit access, to mention but a few (Vellema and Boselie, 2003; KIT, 2006; Vermeulen et al., 2008; Mendoza and Thelen, 2008). Therefore, the effective combination of arrangements is far from being an easy process and even can be problematic and can cause conflicts (for instance, due to power asymmetries, vertical relations, unequal distribution of benefits, etc), so it is in the 'orgware' dimension of innovation where these can be coordinated or facilitated. It requires a process of new adjustments, with actors acquiring new skills, learning to play different roles, taking new positions in the value chain, negotiating and sharing benefits among other actions; which implies a process of social learning (Leeuwis, 2004 ; Röling, 2002). The way how the social organisation of innovation is coordinated affects both the process of innovation and the way how innovations are embedded.

However, it is still not clear who are the actors that dynamise this process, connecting different actors of the innovation system, filling the gap between knowledge and practice and facilitating spaces for social learning and innovation, among other crucial functions. Here the importance of the roles to be played by innovation brokers in innovation processes is envisaged.

3. FROM INNOVATION INTERMEDIARIES TO INNOVATION BROKERS

The roles of intermediaries in innovation systems have developed through time responding to societal changes affecting agriculture, such as the more explicit inclusion of societal actors in innovation processes, less hierarchical and more horizontal forms of governance, and fragmentation of knowledge infrastructures (research, extension) due to privatisation and decentralisation (Moss, 2009 ; Klerkx et al., 2009). In this landscape, the emergence of new agents was required for connecting those different networks of actors at different levels, crossing constantly the boundaries of technology, knowledge, market, policy, and civil society domains (Healey et al., 2002).

In such societal changes the concept of 'innovation intermediaries' (Howells, 2006) emerged as an alternative to public agricultural extension services that were offered through a lineal pipeline approach. An innovation intermediary is defined as "an organisation or body that acts [as] an agent or broker in any aspect of the innovation process between two or more parties." (Howells, 2006 p.720). In an innovation system, innovation intermediaries are in charge of linking actors of public, private and civil organisations, input suppliers, producers, transporters, traders, and international agri-food firms (Klerkx and Leeuwis, 2009; Klerkx et al, 2009).

Innovation intermediation can be pursued as a parallel activity to other main functions of an organisation, such as providing research services, or policy formulation (Howells, 2006). However, such intermediation that consists mostly in bridge building and brokering as a side-activity is less likely to actively promote learning processes, or network building, and may pay more attention and benefit of particular actors in the value chain (Smits and Kuhlman, 2004), because it represents a certain interest.

A specialised type of innovation intermediary called 'innovation broker' (Klerkx and Leeuwis, 2009) pursues a brokering role on innovation as its core function, and does this from a more neutral and impartial 'honest broker' position (Klerkx et al., 2009). They play a crucial role as systemic intermediaries that facilitate information flows, connect partners, articulate demands, communicate needs, and facilitate linkages (network composition) and other functions related to innovation processes (Klerkx and Leeuwis, 2009; Van Lente et al, 2003). An innovation broker is focused "neither on the organisation nor the implementation of innovations, but on enabling other organisations to innovate" (Winch and Courtney, 2007 p751). They are thus mainly 'facilitators of innovation' who do not contribute with substantive knowledge or technology (such as research organisations), or make a strong policy driven contribution (such as government), but principally enhance the interaction between those actors. This connects to the 'knowledge broker' function that is envisioned as a new role for extension, but as innovation comprises more than knowledge exchange, 'knowledge broker' is too limited as a concept. The different innovation brokering roles can be summarised in three processes:

- Demand articulation: articulating innovation needs and visions and corresponding demands in terms of technology, knowledge, funding and policy, achieved through problem diagnosis and foresight exercises.
- Network composition: facilitation of linkages amongst relevant actors, i.e. scanning, scoping, filtering and matchmaking of possible cooperation partners (Howells, 2006).
- Innovation process management: enhancing alignment in heterogeneous networks constituted by actors with different institutional reference frames related to norms, values, incentive and reward systems. This requires continuous 'interface management' (Smits and Kuhlmann, 2004) in which there is a 'translation' amongst the different actor domains, described as 'boundary work' (Kristjanson et al., 2009). Furthermore, it includes a host of facilitation tasks that ensure that networks are sustained and become productive, e.g. through the building of trust, establishing working procedures, fostering learning, managing conflict and managing intellectual property (Leeuwis, 2004).

A general typology of innovation brokers was assembled based on studies in an agricultural context in the Netherlands (Table 1) and is composed of seven distinct types of innovation brokers. While types 1,2, 3 and 5 are generally concerned with more incremental innovations at the level of the farm and its direct surroundings, types 4 and 6 tackle more systemic and radical innovations, which encompass a wide range of actors in the value chain and innovation system, and usually encompass more comprehensive technological, organisational and institutional changes.

Table 1. Typology of innovation brokers in a Dutch agricultural context

| Type | Description |
|------|---|
| 1 | Innovation consultants, who focus on individual farmers, connecting these with service providers and other relevant stakeholders for generally incremental change in farm technology or practices |
| 2 | Innovation consultants, as type 1, but who focus on groups of farmers with a shared interest for a particular innovation |
| 3 | Peer network 'academies', forming peer learning structures (resembling farmer field schools) |
| 4 | Systemic instruments as the previous but with higher level innovation architecture (e.g. clusters and networks), inducing radical innovations which require a fundamental re-ordering of the socio-technical system |
| 5 | Internet portals, which connect all kinds of virtual connection tools (social networks, wiki's, databases, etc.) |
| 6 | Research councils with 'innovation agency', i.e. not only planning and funding research but also ensuring its use in practice |
| 7 | Education brokers, which involves connecting agricultural education, basic research and research that supports policy making |

Klerkx et al., 2009

In emerging economies, innovation brokering roles are played by national NGOs, international NGOs, (descendents of) special projects, international donor agencies, national research and extension programs, farmer and industry organisations, research organisations or affiliates, specialist third party organisations, government organisations and Information and Communication Technologies (ICT's) based brokers (Klerkx et al., 2009). Many of these organisations are however not specialised innovation brokers.

4. INNOVATION BROKERS IN VALUE CHAIN-NETWORK INNOVATION

In this section some empirical evidence is presented on the roles of innovation brokers (or organisations providing innovation brokering roles as a side-activity) in some intervention approaches that have been implemented in developing countries. Over the past decade there has been an increasing number of projects that are testing novel strategies or intervention approaches to enhance farmers' livelihoods, through improving their linkages to markets and inclusiveness in agricultural value chains in developing countries (Shepherd, 2007; Lightfoot and Scheuermeier, 2007, Prasad and Hambly, 2009; Devaux, et al., 2007; KIT, 2006; Kaaria et al., 2008), but little attention has been given to study innovation brokering roles.

Two cases from experience of the authors with intervention approaches are analysed in light of the theories of innovation brokering, presenting some empirical evidence of different types of arrangements made by innovation brokers. A third case was taken from the literature. Data from questionnaires, key informant interviews, participant observations of different types of activities and processes carried out in those approaches, SWOT analysis and project reports were used for the analysis of different types of brokering roles and to draw some lessons.

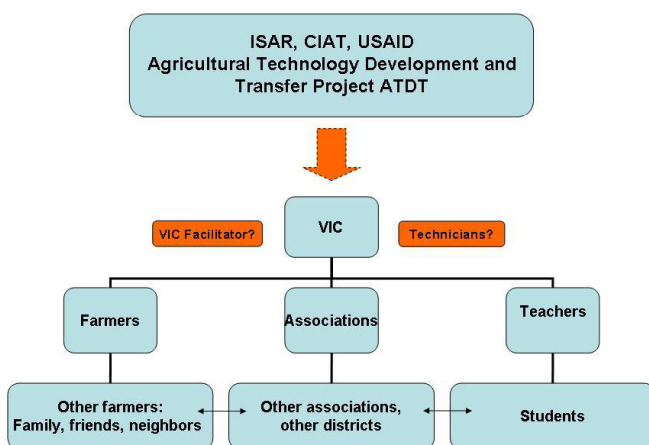
4.1. Facilitating community spaces for local innovation networks: Village Information and Communication Centers in Rwanda

The Village Information and Communication Centers (VICs) were implemented by the Agricultural Technology Development and Transfer (ATDT) project in Rwanda as a way to facilitate information to small farmers who live in rural remote areas and for whom it was difficult to visit the research station to access agricultural information and inputs. This project was managed by the International Center for Tropical Agriculture (CIAT) and the Institute of Agronomic Sciences of Rwanda (ISAR).

The VICs are hosted and facilitated by farmers' associations, which are the most common and fundamental organisational form for farmers to access resources like communal land, knowledge, agricultural inputs, extension services, funds, among others; these associations thus play the role as intermediary organisations (Howells, 2006). Farmers see that these are advantages that small farmers cannot access individually. In the VIC farmers access information materials in their own language, and take advantage of other community services for supporting value chains (shop for sale of agricultural inputs, storage services, amalgamation of products for getting better prices, cooperative banks, training point, community meeting places and so forth) in their own village (Pérez et al., 2009). These community spaces also represent an opportunity for farmers to learn new agricultural techniques by doing and sharing knowledge through demonstrations and exchange visits, which are platforms for the formation of "communities of practice" in rural communities (De Jager et al., 2009; Pérez, et al., 2009; Nonaka, 1995).

However, in an assessment of VICs in Rwanda (Pérez et al., 2009) some missing linkages in processes of communication were one common problem that was found, which exposed some demands of facilitation of communication for the embeddedness of innovations in the VICs. In general, the communication linkages were multidirectional at the community level; however these became unidirectional at the level of the research organisations (Figure 1). One of the reasons given by farmers was that there were very few extension agents for visiting the VICs to communicate their problems to the research organisations. Another constraint related to lack of facilitation; it was found that even if the information materials were written in their local language and were very didactic, farmers considered that they still needed technicians or somebody to whom they could ask questions, or to request demonstrations of the processes described in the information materials. They also demanded access to a type of mediator to ask for information, agricultural inputs, services or other inputs for the development of their agro-enterprises. In conclusion, someone specially dedicated to dynamise all the activities and demands of the users of the VIC.

Figure 1. Flows of information and communication between VIC users and agricultural R&D organisations



Pérez et al., 2009

VICs were implemented originally having the facilitation roles played by extension agents of ISAR. They used to help farmers in the adoption of technologies, but after some time they started playing the role of gatekeepers (Graf, 2007), diffusing external information and

knowledge in the local community and vice versa, and even broadened their roles in other innovative ways, like helping communities affected by HIV. But due to priorities in the work agenda and that the number of VICs was increased by demand of the communities, the extension agents could no longer visit all the VICs on a regular basis. As a response to this gap, the roles of coordinating and supporting the activities of the VIC were taken by community leaders, teachers, or other actors who were very committed to the community. An incremental social innovation took place, mixing old and new components to the VIC. Moreover, one farmer association that hosted one of the VICs decided to hire an agronomist to direct their needs in a more systemic level, to bridge the missing linkages, connecting the association with various stakeholders, and in general to address effectively community needs. This was a more radical social innovation.

One lesson we draw from this experience is that for innovations to be effectively embedded, some social and institutional arrangements have to be made, for instance, having an innovation broker in the VIC. However, other radical arrangements are needed for the sustainability of innovations (for example, arrangements at a policy level). In contrast to the Dutch context where farmers can afford to pay for innovation brokering services, it is very exceptional that farmers' associations in Rwanda have the financial capacity to hire those services.

4.2. Managing innovation networks for radical and systemic innovation: Papa Andina Initiative

One example of innovation brokering role at a systemic level is taken from the case of the Papa Andina Regional Initiative in South America led by the International Potato Centre (CIP), which used two approaches (Participatory Market Chain Approach and Stakeholder Platforms) to foster commercial, technological and institutional innovations through communication and collective action among different and large networks (Devaux et al., 2009).

The stakeholder platform was a dialogical, central and neutral space where different stakeholders of the value chain (small-scale potato producers, traders, processors, researchers and other service providers) met face to face and had the opportunity to communicate common problems and negotiate solutions; they envisioned different scenarios, tested different ways of working together, planned collective agendas, shared resources, distributed benefits and made other necessary arrangements. These arrangements stimulated strategic alliances and knowledge sharing processes across organisational boundaries and facilitated linkages for farmers to market niches.

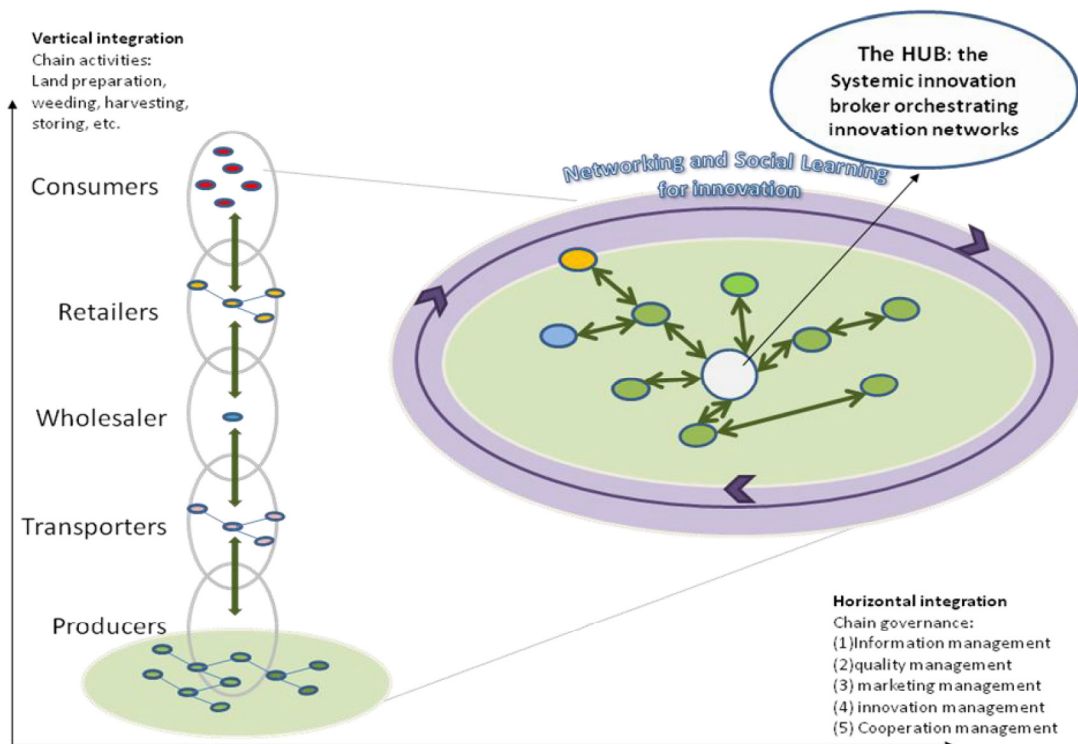
Small holders were supported to form farmer associations to do collective marketing, reducing marketing costs and resulting in better negotiations. They also learnt more about potential markets and services providers. The philosophy was solving problems through collective action and innovation at different levels. This involves an effective facilitation through a dynamic and tailored management of innovation networks, taking into account the context.

Some successful innovations were outcomes of collective action in this approach. The potato value chain achieved better quality and production, there were new technology innovations like the potato grader, information flow through bulletins with information about the prices of 20 varieties of potatoes was improved, and there was value addition on the commercialisation of yellow native potato chips (Devaux et al., 2009).

One of the main lessons from this case is that collective action does not just happen - it needs good facilitation (Devaux et al., 2009), which results in generating not just tangible benefits for actors who get involved, but also some qualitative ones.

The innovation network (the platform) was thus facilitated by a systemic innovation broker (CIP), in a central and neutral position to manage different innovation networks (Figure 2), as a hub (see Dhanaraj and Parkhe 2006, Figure 3, in appendix) or a 'network broker' (Snow et al., 1992). Its position as a hub improves the management of innovation processes, such as helping other organisations to manage resources, to enhance participation of networks on innovation processes (for instance, sharing of knowledge in open safe spaces), avoiding situations where some actors benefit more than others. Small farmers participated as other actors of the value chain in capacity building, decision making and negotiation processes (horizontal integration-chain governance) going further than the limited activities related to cropping, production and harvesting (vertical integration-chain activities).

Figure 2. Value chain-network innovation



Pérez, 2009

4.3. Integrating glo-cal innovation networks: ICT mediated approaches in Africa, Asia and Latin America

Following the concept of the systemic broker orchestrating the innovation networks like a hub firm, approaches based on the use of Information and Communication Technologies (ICTs) are opening virtual spaces (hub spaces) to promote linkages among different actors of the value chain, integrating global and local innovation networks (glo-cal). These approaches present new opportunities for knowledge production and invites for changes in the way of approaching agricultural innovation through glo-cal networked communities (Mendoza and Thelen, 2008; Castells, 2000; Pérez, 2003).

There are various interventions that have developed information systems using internet platforms and mobile phones as media to share market information and prices of commodities¹. Mobile phones are facilitating linkages of farmers to local, national and international markets. In Philippines, Uganda, South Africa and Kenya² farmers get information by voice and text messages on markets and prices, daily or seasonal weather forecasts, the production of pesticides and even for money transfers. There is an ICT revolution that gives farmers access to more resources and possibilities for innovation. However, behind all the technological arrangements of these innovative ICT approaches there are various social arrangements and social learning processes taking place.

One example is the case of a pilot project called InforCauca: Community Telecenters, which implemented two rural telecenters in Southern Colombia by CIAT. Community Telecenters are defined as “public spaces where a community can use ICTs to implement social development programs, support the social and personal development of the individuals and communities they serve, and contribute to improving the quality of life of people” (Amariles et al., 2003, Menou et al., 2004).

The criterion for selecting the organisations to host telecenters was that the organisation was in a marginal rural area, with capacity to host a telecenter. To run a telecenter, there were operators that were trained to train others in computer programs, and to strengthen the capacity of the hosting organisations to access and manage information about their institutions, their projects and agro-enterprises. Also, these operators were in charge of producing the web sites of the hosting organisations, to address community information and communication needs and to train small farmers in the use of ICTs. But, their roles developed further than initially expected; the operators, who were based in the communities, become very important for the community of users who visited the telecenters. They helped farmers and other users of the telecenter to solve personal and community information and communication needs: helping to write community projects, funding proposals, helping students to make homework, facilitating virtual meetings by internet, communicating needs of farmers to research institutes, and many other roles. Given their broad experience in training and mentoring rural communities, they were also called as types of consultants for a national program initiative that promoted the use of ICTs for social development. This variety of roles offered by the operators made the telecenter socially sustainable and with very valuable results. However, the use of telecenters and some other ICTs have some limitations like connectivity, lack of skills of farmers (i.e. not just literacy but digital literacy) and accessibility (Pérez, 2003; Parkinson, 2005).

One of the expectations of the staff of InforCauca project was that the telecenters would help farmers to improve their livelihoods, through making linkages with local, regional or international markets. But the innovative uses that those telecenters took, was something that the project learnt from. Each telecenter matched the needs and circumstances of the two hosting organisations and their communities, not expected outcomes.

The telecenter of CorpoTunía was focused on promoting agro-enterprise development. The operators of the telecenter helped some of the farmers who participated in the agro-enterprise of flowers navigate the internet to find contacts for exporting their flowers. But

¹ www.uce.co.ug, <http://www.tradenet.biz/home/index.cfm?i=23312&lang=en&home>

² http://www.economist.com/surveys/displaystory.cfm?story_id=1448384

what they found was that large volumes were a prerequisite for export, that compliance of international quality standards was required in order to sell in international markets, that the flowers had to be transported in specific conditions, and that there were some certification processes for exportation. The producers realised that they didn't know about the functioning of international markets, that many arrangements (organisational, technological, etc) had to be made, and that they had to enrich their capacity to be able to comply with international standards. The first step they took was to form a regional enterprise of flowers, which at the same time was connected to the national exporting organisation of flowers.

Other innovative uses were given to the telecenter, facilitated by the operators of the telecenters and staff of InforCauca. Professors and students of Tunía used the telecenter for their educational activities. This resulted in a project in which students from Spain exchanged experiences with students from Colombia and Morocco, as a mechanism to promote cultural knowledge sharing and diminish discrimination from Spanish students to those migrant communities living in Spain. InforCauca project was also the niche for a pilot experience of distance learning using the platforms of telecenters, in which the exchange of expert knowledge and traditional knowledge was promoted through didactic materials put on line on a web site and chats among experts from different areas and rural communities from various Latin American countries (Pérez, 2003).

Another innovative experience took place in the telecenter hosted by the *Asociación de Cabildos Indígenas del Norte de Cauca* (ACIN), an indigenous organisation with a well organised social structure and various projects for the development of indigenous communities (agro-enterprises, rural planning, agriculture, health, gender, etc). This telecenter was located in a region with lots of security problems.

In this telecenter, the operators played brokering roles supporting the activities of the projects, helping to write proposals, sending information, matching demands, and in general, similar roles to those played by the operators of the telecenter in Tunía. What was innovative in this case is that during clashes of the *guerrillas* in the mountains, the telecenter was crucial as the central point to communicate to the national and international public instances of human rights violations. The operators developed an integrated information and communication system, combining ICTs with their traditional media. Messages were sent to the telecenter and from the telecenters to the rural areas via the driver of a colourful public transport bus (called a *Chiva*), which are very common in the rural areas in Colombia. These messages were sent by internet to governmental organisations, to international organisations watching human rights and even to the media. The operators of the telecenter also downloaded information from internet and put it onto a diskette to send to the rural areas. The information sent through *ChivaNet* was also transmitted by the radio station of ACIN. This innovative way of information and communication was called *ChivaNet* and helped the indigenous communities to make their voices heard in a situation where they could not leave their places because they were in the middle of the war.

There were various lessons learned, but the most important is that the success of innovations cannot be reduced to the realisation of expected outcomes attached to planned trajectories and impacts. The facilitation of the operators of the telecenters was a fusion of different types of innovation brokering roles described in the typology of innovation brokers, plus high levels of commitment, translation of contextual needs into innovative strategies for facilitation, digital literacy, and capacity to learn by doing and to share knowledge. It was indeed a process of social learning.

5. CONCLUSIONS

This limited set of approaches has shown the need and importance of the roles of innovation brokers for the embedding of innovations and for enhancing innovation capacity. The roles of innovation brokers were envisaged as crucial: building and managing the innovation network in a central and equitable way, bridging the missing linkages, connecting global and local networks, enhancing social learning processes, and in general, helping other to try innovative ways of doing things, taking into account the contextual needs. Innovation brokers can integrate small farmers in vertical and horizontal activities of the chain, adding value not just in terms of quality of products and earnings, but also in adding value to social processes (value chain-network innovation). In this way most of actors participating in intervention approaches (especially small farmers) enhance their capacity to respond to the new challenges of value chains.

The introduction of Information and Communication Technologies (ICTs) and Integrated Information and Communication Systems aggregate value to the production and sharing of knowledge. In the VICs, multi-stakeholder platforms and community telecenters there are physical, dialogical and virtual (central and neutral) “spaces”, which are very important for linking different actors to communicate their common problems and finding novel solutions. These spaces allow sharing various resources, the combination of different types of knowledge (traditional and formal), and the formation of multidisciplinary innovation networks, among other possibilities. This represents a transition of paradigm for approaching agricultural innovation to more participative and open approaches, which offers a promissory landscape for organising the value chain actors in a way that is more favourable for small farmers.

Open safe spaces are needed for experimentation, creation and adaptation of innovations. As it was seen in the cases, various innovations have taken place in a process of trial and error, by chance, or by force of circumstances. Therefore, the roles of innovation brokers go beyond implementation of pre-designed technologies and predetermined outcomes. Innovation is a context sensitive process. Also, more holistic frameworks are needed for the evaluations of impacts of the approaches. Arrangements made by innovation brokers for enhancing innovation capacity of small farmers do not always result in improvements in terms of ‘kilograms per hectare’ or ‘dollars per day’. The arrangements that innovation brokers facilitate are often not formally recognised and neither is the importance of the substantial impacts of their work, given that some impacts are difficult to measure such as social learning, knowledge, enhancement of trust, better negotiations, commitment, social capital and value addition through local knowledge, among other. These findings confirm earlier findings by Klerkx et al. (2009), and Kristjanson et al. (2009).

In the cases presented here there were combinations of types of innovation brokers found in the Dutch context (Table 1): ICT mediated (type 5) combined with local-traditional approaches of indigenous communities to share knowledge like *ChivaNet*, in which the operators of the telecenters resembled a type 2 innovation broker; ICT mediated approaches (type 5) combined with a type 7 and type 3, like the initiatives of distance learning experiences using the platform of telecenters; multi-actor innovation networks communicating in dialogical spaces, with CIP acting as a type 4 innovation broker, who facilitated the Papa Andina multi-stakeholder platform (the hub). The stakeholder platform allowed to play the brokering role as a multi-organisational entity in a central and neutral position (for instance, for managing power asymmetries) between the innovation networks. The intermediaries who managed these spaces played the brokering role as a core function

(the agronomist hired for managing the VIC and the operators of the telecenter) and some as a side activity (like the extension agents of ISAR in Rwanda) in the VICS.

These findings confirm what Klerkx and Leeuwis (2009) also observed, that many innovation brokers do not fit neatly in a category, but are hybrids of several types. Furthermore, and more importantly, they reveal that contrary to earlier findings (Klerkx and Leeuwis, 2009), ICT mediated approaches are not passive brokers (in the sense of just displaying available information, but not more actively articulating demand and making matches), but fulfil an active role in connecting people.

However, more empirical evidence is needed about innovation brokering roles and possibly also a broader typology of their functions, characterising roles and considering hybrid types of innovation brokers that are present in developing countries. A typology of functions of innovation brokers grounded in several different contexts, would serve as a basis for the design and implementation of intervention approaches (processes of institutionalisation), offering different options for facilitation of innovation and a conceptual framework for the management of innovation networks. A PhD research is currently being conducted comparing different intervention approaches for value chain-network innovation in Sub-Saharan Africa, looking at different roles played by innovation brokers in the management of innovation networks and exploring how different modes of network governance foster or hinder the realisation and embedding of innovations (Pérez, 2009).

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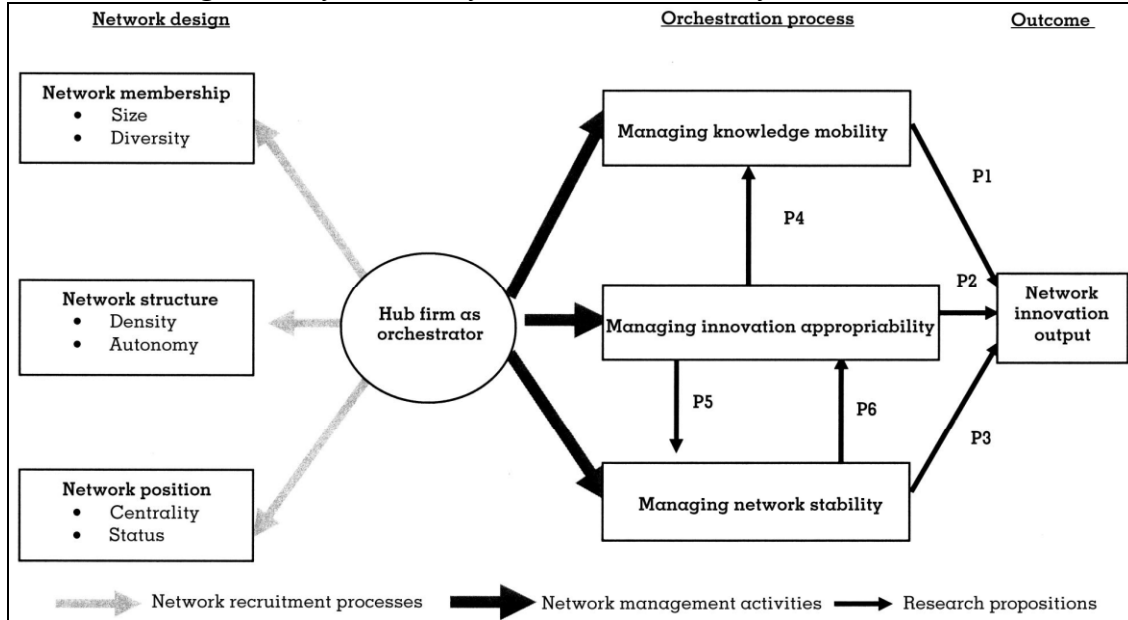
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APPENDIX

Figure 3. A framework for the orchestration of innovation networks



Dhanaraj and Parkhe, 2006

The hub firm has three functions for the orchestration of firms: Managing knowledge mobility, innovation appropriability and network stability. This firm “possesses prominence and power gained through individual attributes and a central position in the network structure, and that uses its prominence and power to perform a leadership role in pulling together the dispersed resources and capabilities of network members” (Dhanaraj and Parkhe, 2006: 259).